Bring the ball to the position B′ again, and project it at right angles, or at any angle, to the plane BAB. The ball now illustrates three-dimensional motion. The period is slow, and the experiments are very interesting and instructive.

MAGNUS MACLEAN.

NOTES.

THE bi-centenary of the publication of Newton's "Principia" was celebrated on Thursday last at Trinity College, Cambridge. A long and admirable address was read by Dr. Glaisher to a distinguished audience which had been invited to Cambridge by the Master and Fellows of the College. At a numerously attended dinner in Hall in the evening, speeches were made by the Master, the President of the Royal Society, the Astronomers-Royal for England and Ireland, and other distinguished guests.

AMONGST the missions just approved by the Special Commission of the French Ministry of Public Instruction are the following: M. Nickles, mining engineer, to carry out in the provinces of Valencia and Alicante, in Spain, geological investigations; Dr. Morisse, to undertake various medical and natural history studies in the basins of the Upper Orinoco and Amazon; the Abbé Hyvernat, to proceed to Armenia to copy the cuneiform inscriptions on the shores of Lake Van, to investigate the art of Assyria, and to study on the spot the Neo-Syriac dialects spoken in the basin of Lake Urumiyah; M. Gay, to undertake a mission to Nicaragua, Columbia, and Venezuela, to study the natural history, and make collections for the State Museums; M. Thoulet, Professor of Mineralogy in the Faculty of Sciences at Nancy, to study the organization of the Observatory of Christiania, and of the Scottish Marine Biological Station at Edinburgh.

THE Bill to provide for technical education in England and Wales, prepared and brought in by Sir H. Roscoe, Sir U. Kay-Shuttleworth, Sir B. Samuelson, Mr. G. Dixon, and Mr. A. Acland, has been printed. It provides (1) that any School Board may make provision for giving technical education in any school under their management, and either by day or evening classes, or both, as may seem fit, having regard to the daily occupations of the persons to be benefited thereby; (2) that if no such provision is made, or if it is insufficient, and if the local authority by special resolution determine that provision or further provision ought to be made, they may themselves make such provision. The Bill also provides for the rendering of aid by School Boards or local authorities to voluntary schools in which technical instruction may be given; and two sections define the conditions under which Parliamentary grants shall be made for the encouragement of such instruction both in voluntary schools and in Board schools. It is proposed that any School Board or local authority, should they think fit, may institute an entrance examination in reading, writing, and arithmetic, for persons desirous of attending technical schools or classes under their management, or to which they contribute.

THE *Colonies and India*, commenting on the movement in favour of technical education in the colony of Victoria, says it will not be the fault of the Victorian Government if technical education is neglected, as there is a feeling in the Cabinet that if the country is to progress the rising generation should have the advantage of technical teaching. The Minister of Public Instruction has issued a minute on the policy of founding a Victorian Technical University, which is a digest of some of the evidence given before our own Royal Commission on Technical Instruction. Mr. Pearson estimates the initial expenditure involved in the foundation of a separate technical University at from £500,000 to a million, besides a yearly endowment of at least £30,000. The latter sum appears out of proportion to the average endowments of such institutions in Europe and America. It is not doubted that the money required will be freely voted.

THE following resolution was passed at a meeting of the American Philosophical Society on January 6, and has just been received by some of the scientific Societies of Great Britain in a circular dated March 12:—"*Resolved*, That the President of the American Philosophical Society be requested to address a letter to all learned bodies with which this Society is in official relations, and to such other Societies and individuals as he may deem proper, asking their co-operation in perfecting a language for learned and commercial purposes, based on the Aryan vocabulary and grammar in their simplest forms; and to that end proposing an International Congress, the first meeting of which shall be held in London or in Paris."

THE general meeting of the Institution of Mechanical Engineers will be held on Thursday evening, May 3, and Friday afternoon, May 4. The chair will be taken by the President, Mr. Carbutt, at 7.30 p.m. on Thursday evening, and at 2.30 p.m. on Friday afternoon. The following papers will be read and discussed as far as time permits:—Third Report of the Research Committee on Friction: experiments on the friction of a collar bearing; description of the emery testing machine, by Mr. Henry R. Towne, of Stamford, Connecticut; and supplementary paper on the use of petroleum refuse as fuel in locomotive engines, by Mr. Thomas Urquhart, Locomotive Superintendent, Grazi and Tsaritsin Railway, South-east Russia.

SURGEON-MAJOR F. S. B. FRANÇOIS DE CHAUMONT, F.R.S., Professor of Military Hygiene at the Army Medical School, Netley, died at his residence at Woolston, near Southampton, on the 18th inst. He was fifty-five years of age.

AT the meeting of the Society of Arts on the 18th inst., Sir Howard Grubb read a paper on telescopes for stellar photography. His object was to discuss and describe a few of the more important mechanical details of the instruments which are to be used for the international photographic survey of the heavens. The paper is printed in the current number of the Journal of the Society of Arts.

ON March 31, about 10 p.m., a splendid meteor was seen at Asker, in Nerice, in Sweden. It appeared in the southern sky, increasing in brilliancy in its descent. Finally it seemed to burst into three parts, each of which left a trail in the sky observable a few seconds. The colour was intense bluish-white.

SEVERE shocks of earthquake were felt at Oldenburg on April 12. Several houses fell in at Eisenstadt. Shocks were also noticed at Pottendorf, in Lower Austria.

A HYDROGRAPHICAL BUREAU has been opened in Würtemberg, under the direction of Herr von Marten.

WE are glad to hear that a regular meteorological organization is to be established in Spain. The Director, appointed by "competitive examination," is Señor Augusto Arcimis, formerly of the Institution Libre de Ensenanza, Madrid. M. Arcimis has long been known as a meteorologist.

MM. MOHN AND HILDEBRANDSSON have published an important discussion on the "Thunderstorms of Scandinavia" (Upsal, 1888, 55 pp. and 12 plates). The first network of thunderstorm stations was established in France by Leverrier in 1865, and his plan has been adopted in most other countries, almost without change. Norway followed next, in 1867, and Sweden in 1871. The storms are divided into two classes: (1) heat thunderstorms, which occur generally in summer, and mostly originate in the central and eastern parts of the Scandinavian peninsula 2) cyclonic thunderstorms, which generally occur in winter, on the western coasts, and accompany a barometric depression coming from the Atlantic. An attempt is made at fixing the heights of thunderstorm clouds, but these vary very much with different times and localities; it seems proved, however, that the movements of the cirrus clouds are in no way affected by the storms. The summer storms occur most frequently in the afternoon, and most rarely between 2 and 4 a.m. But on the coast of Norway the maximum frequency occurs about 8 p.m., and the winter storms occur more frequently in the night. These facts have also been pointed out by Dr. Buchan with regard to the storms of the north-west of Scotland. In the annual period the storms occur most frequently in July and August, but there is also a secondary maximum in January. The work contains much that would repay careful study.

THE monthly meteorological notes and rainfall statistics for South Australia, published by Mr. C. Todd, the Government Astronomer, contain very useful climatological data and notices of miscellaneous phenomena. Mr. Todd has taken advantage of his position as Postmaster-General to establish meteorological or rainfall stations at a great number of telegraph offices; the number of reports published for February 1887 is 298, together with the means for all stations having at least seven years' record. The observations in their present form seem to date from 1883, when 235 records were published, but the work commenced as as far back as 1857, since which time it has been steadily pursued. For Adelaide itself, the records of Sir G. S. Kingston extend back as far as 1839, and these observations have been used by Mr. Todd in his excellent article on the climate of the colony in the "Hand-book of South Australia." It is stated in this work that local features are apparently insufficient to explain the large differences in the yearly averages of the rainfall; Mr. Todd's continued exertions must tend to elucidate this subject.

A NEW series of isomorphous double chlorides of the metals of the iron and alkali groups have been prepared by Dr. Neumann (*Liebig's Annalen*). The general formula of the system is $4RCl \cdot M_2Cl_6 + 2H_2O$, where R may represent any member of the group of alkali metals, and M either iron, chromium, or aluminium. Magnesium and beryllium are also included in the series, $2MgCl_2$ or $2BeCl_2$ replacing $4RCl$. They all crystallize in forms belonging most probably to the regular system, generally in octahedrons or rhombic dodecahedrons. The iron salts especially are remarkably beautiful, $4KCl \cdot Fe_2Cl_6 + 2H_2O$ forming octahedrons and dodecahedrons of reddish-brown tint, while crystals of the corresponding ammonium compound possess a magnificent garnet-red colour; the rubidium and magnesium salts are yellow, and the chloride of beryllium and iron separates in fine orange crystals. These iron salts, the first two of which have been known some time, are prepared comparatively readily by dissolving ferric chloride in concentrated hydrochloric acid, adding the necessary quantity of the alkaline chloride, and crystallizing. But Dr. Neumann, in attempting to complete the series, found considerable difficulty in preparing the corresponding chromium and aluminium salts. He eventually succeeded completely, in the case of chromium, by dissolving the chromium chloride in warm 96 per cent. alcohol, adding a proportionately small quantity of the other chloride and passing a rapid stream of hydrochloric acid gas, the whole being gently boiled for some time, using a reflux condenser. It was found that the 4 per cent. of water, together with that liberated during the formation of ethyl chloride, was just sufficient to supply the water of crystallization, hence on cooling the double salt crystallized out in microscopic crystals resembling in shape those of their ferric brethren. These chromium salts are of various shades of violet, are deliquescent like all other members of the series, and are likewise decomposed by water. The only aluminic member of the series yet prepared by Dr. Neumann is the potassium compound $4KCl \cdot Al_2Cl_6 + 2H_2O$, which, however, is one of the finest of the whole class; it crystallizes in splendid octahedrons, resembling large diamonds and refracting light with similar brilliancy. Crystals will ever remain among the choicest fruits of the chemist's labour, and form an inexhaustible source of pleasure to lovers of the beautiful. The new isomorphous group is of great theoretical interest, and will take its rank with the well-known alums and the double sulphates of the ferrous-ammonium type.

A MOST interesting account of the work in mound-exploration carried on by the United States Bureau of Ethnology, has been issued by the Smithsonian Institution. The writer is Mr. Cyrus Thomas. It seems that over two thousand mounds have been explored, including almost every known type as to form, from the low, diminutive, circular burial tumulus of the north, to the huge, truncated, earthen pyramid of the south, the embankment, the effigy, the stone cairn, house site, &c. Every hitherto known variety as to construction, as well as a number decidedly different in details, has been examined. Some of the latter are very interesting and furnish important data. Particular attention has been paid to this branch of the work, because the mode of construction and the methods of burial in the ordinary conical tumuli furnish valuable data in regard to the customs of the builders, and aid in determining the archæological districts. Many ancient graves and cemeteries and several *caches* and cave deposits have also been explored. The number of specimens obtained by the division since its organization is not less than thirty-eight thousand. The specimens procured by the field assistants in person constitute by far the most valuable portion of the collection, since the particulars regarding their discovery and surroundings are known. Not a single stone or tablet with anything like letters or hieroglyphics inscribed on it, by which linguists might be able to judge of the language of the mound-builders, has been discovered.

A SECOND Laura Bridgman is at present attracting the attention of American psychologists. Her name is Helen Keller. Although blind and deaf, she makes rapid progress in her studies. *Science* (April 6) gives her portrait and that of her teacher, Miss Annie Sullivan, a graduate of the Perkins Institute at Boston, and also reproduces in *facsimile* a letter written by Helen Keller to A. Graham Bell, of Washington. It was only in March 1887 that Miss Sullivan was engaged to give the first instruction to her pupil, who was then six years old. In a month the little girl learned to spell about 400 words, and in less than three months could write a letter, unaided by anyone. In six weeks she mastered the Braillé (French) system, which is a cipher for the blind, enabling them to read what they have written. She has also mastered addition, multiplication, and subtraction, and received lessons in geography. She is trained solely through the sense of touch.

THE new number of the "Year-Book of the Scientific and Learned Societies of Great Britain and Ireland" (Griffin and Co.) has just been published. This is the fifth annual issue. It comprises lists of papers read during 1887 before Societies engaged in all departments of research, with the names of their authors. There is also an appendix, presenting a list of the leading scientific Societies throughout the world. The work is a useful one, but it ought to have been more thoroughly revised. On the very first page, in the list of the members of the Council of the Royal Society, two names are wrongly given: Sir A. (instead of W.) Bowman, and R. (instead of W.) T. Thiselton Dyer.

A PAPER entitled "Additional Records of Scottish Plants for the Year 1887," by Mr. Arthur Bennett, has been sent to us. It consists of a list of the new county botanical records which came under Mr. Bennett's notice during 1887, and forms a continuation of the lists which appeared in the *Scottish Naturalist* for 1886 and 1887. Mr. Bennett says that the results during the year 1887 were probably richer than in any former year, not only in the large number of comital records, but in the new species added to the Scottish flora.

WE have received several numbers of the *Annales de la Faculté des Sciences de Toulouse* (Paris: Gauthiers-Villars). This new publication (which is well printed on good paper, with wide margins) consists chiefly of memoirs relating to physics, chemistry, and mathematics pure and applied. It contains also articles on questions of general scientific interest. To papers of the latter class the authors append lists of books on the questions discussed.

ACCORDING to a paper in the *Board of Trade Journal* for April, the production of attar of roses constitutes one of the most important branches of native industry in Bulgaria. The valley of Kezanlyk, known as the Vale of Roses, is the centre of this production, which extends as far as Carlovo, and the villages which lie sheltered from the north wind by the vast chain of the Great Balkans. In 1885, and no later statistics have been published, the manufacture of attar of roses in the district indicated amounted to a value of 1,100,000 francs. The prosperous condition of the valley of Kezanlyk has led other districts of Bulgaria to develop the same industry, and particularly the inhabitants of Strema, and of Toundja, at the foot of Mount Rhodope. It is not yet certain that the attar from these new countries will equal in quality the famous product of Kezanlyk. The Government, however, is anxious to encourage this movement, and the Department of the Interior has lately authorized the purchase of a certain quantity of attar prepared at Strema and at Toundja. Specimens of each are to be sent for examination at the laboratory of the University of Moscow, and the result is to be published.

FROM an official report just published it appears that in 1886 there were killed in Norway 114 bears, 37 wolves, 5618 foxes, 950 eagles, 5100 hawks, and 108 other animals of prey. The number of bears was slightly below that of 1885, but above the numbers of previous years, whilst the number of wolves was twice that of 1885. The number of foxes, on the other hand, was only half that of the previous year, whilst those of eagles and hawks were about the same.

IN last week's NATURE (p. 581), near the middle of the second column, for "Ekholm *of* Hagström," read "Ekholm *and* Hagström."

THE additions to the Zoological Society's Gardens during the past week include a Common Marmoset (*Hapale jacchus*) from South-East Brazil, presented by Mrs. Leighton; a Striped Hyæna (*Hyæna striata*) from Morocco, presented by Mr. Herbert E. White; an Indian Wolf (*Canis pallipes* ♂), two —— Foxes (*Canis* ——), a —— Hawk Eagle (*Spizaetus* ——) from India, presented by Colonel Alex. A. Kinloch, C.M.Z.S.; two Rock-hopper Penguins (*Eudyptes chrysocome*) from Auckland, New Zealand, presented by Captain Sutcliff, R.M.S.S. *Aorangi*; a Gannet (*Sula bassana*), British, presented by Miss Serrell; three Common Swans (*Cygnus olor*), British, purchased; a Chinchilla (*Chinchilla lanigera*), a Barbary Wild Sheep (*Ovis tragelaphus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

PHOTOGRAPHY IN THE DETERMINATION OF THE MOTIONS OF STARS IN THE LINE OF SIGHT.—Of the many developments of spectroscopy, one of the most interesting is that first made a practical branch of observation by the skill and patience of Dr. Huggins, viz. the determination of the motions of stars in the direction of the visual ray by measures of the displacement of the more prominent lines in their spectra. The research has, however, always been beset with many practical difficulties, one of the most serious being the manner in which the stellar lines seem to elude the sight when the air is disturbed. This hindrance has been especially felt at Greenwich, where this kind of work has been adopted as part of the ordinary routine, and where, in consequence, it has not been possible, as would be the case in a private observatory, to confine observation to nights of faultless definition. Many of the observations have, therefore, been exceedingly rough, or even discordant. Prof. H. C. Vogel, who had made some successful measures of the displacements of lines in three or four of our brightest stars soon after Huggins's first observations, has recently turned his attention to photography as a means of overcoming this difficulty, and his first results, given in a paper read before the Royal Prussian Academy on March 15, are very promising. Prof. Vogel finds that the atmospheric tremors, so wearisome to the eye, exercise no influence upon the photograph, which possesses the additional advantage of being free from all bias or predisposition. Dr. Scheiner, who has been carrying out these experiments, has examined seven spectra, viz. those of Sirius, Procyon, Castor, Arcturus, Aldebaran, Pollux, and Rigel. Of these, Sirius showed a slight displacement to the red, Procyon a decided displacement, and Rigel very large in the same direction, whilst Arcturus showed a considerable displacement towards the violet. The observations were made on the third line of hydrogen, Hγ, a train of two prisms of high dispersion being used.

THE TOTAL LUNAR ECLIPSE OF JANUARY 28.—Dr. E. Lindemann sends the following list of the number of occultations observed at different Observatories during this eclipse, in addition to the lists given already: Albany (U.S.), 7; Christiania, 28; Milan, 23; Bonn, 7; Durban (Natal), 17; Oxford (Radcliffe), 9; Bruxelles, 14; Liège, 5; Palermo, 8; Cape of Good Hope, 21; Madras, 10. The weather was cloudy at Warsaw.

NEW MINOR PLANETS.—Herr Palisa discovered a new minor planet, No. 274, on April 3, and another, No. 275, on April 13. The latter is his sixty-third discovery. No. 269 has received the name of Justitia.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1888 APRIL 29—MAY 5.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on April 29

Sun rises, 4h. 36m.; souths, 11h. 57m. 10·3s.; sets, 19h. 18m.: right asc. on meridian, 2h. 28·7m.; decl. 14° 41′ N. Sidereal Time at Sunset, 9h. 51m.

Moon (at Last Quarter May 3, 0h.) rises, 22h. 21m.*; souths, 2h. 46m.; sets, 7h. 6m.: right asc. on meridian, 17h. 15·7m.; decl. 19° 30′ S.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Right asc. and declination on meridian. h. m.	° ′
Mercury..	4 23	11 11	17 59	1 42·0	8 45 N.
Venus.....	4 8	10 44	17 20	1 15·8	6 22 N.
Mars......	16 45	22 25	4 5*	12 58·3	4 38 S.
Jupiter....	21 25*	1 40	5 55	16 9·9	20 1 S.
Saturn....	9 40	17 38	1 36*	8 10·8	20 40 N.
Uranus...	16 42	22 20	3 58*	12 53·2	4 58 S.
Neptune..	5 35	13 17	20 59	3 48·6	18 21 N.

* Indicates that the rising is that of the preceding evening and the setting that of the following morning.

Occultations of Stars by the Moon (visible at Greenwich).

May.	Star.	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image. °	°
1	50 Sagittarii	6	3 19	3 33	359	339
3	31 Capricorni	6½	2 50	3 43	112	214

May.	h.	
5	18	Mars in conjunction with and 0° 35′ north of Uranus.